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(54) CABLES AND WINCHING ARRANGEMENTS THEREFOR

(71) We, TELEFLEX LIMITED, (formerly known as Teleflex Products Limited), a British Company of Christopher Martin Road, Basildon, Essex, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention relates to cables and winching arrangements therefor.

According to the present invention there is provided a ribbon-like cable.

constituted solely of a laminate wholly encased in and directly bonded to a plastics matrix,

the laminate being constituted solely of a plurailty of layers superimposed one upon another with each layer extending substantially the width of the cable,

each of the individual layers being constituted solely of a plurality of discrete, flexible filaments of a reinforcement material which extend in the longitudinal direction of the cable and which are wholly encapsulated within and directly bonded to an encapsulating material which maintains the filaments of the layer in positions separated both from one another and from the filaments of the or each adjacent layer of the laminate.

The cable of the invention is preferably utilised in combination with a winch comprising a cable storage drum and a plurality of pulleys around which said cable is led in a sinuous path toward the drum so as to give a substantial arc of contact at each pulley, the drum and the pulleys all being power-driven in an arrangement such that the tension in said cable reduces from pulley to pulley as the drum is approached.

Some embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:—

[*Price 25p*]

Figure 1 shows a cable embodying the invention in diagrammatic cross section;

Figure 2 is a diagrammatic cross section of a pre-encapsulated layer of filaments of the cable of Figure 1;

Figure 3 shows a diagrammatic cross section of a pre-encapsulated layer of filaments of a modified cable;

Figure 4 shows a diagrammatic cross section of a pre-encapsulated layer of filaments of another modified cable; and

Figure 5 is a diagram of a winch for winding such cables.

Referring to Figures 1 and 2, the lifting cable 26 contains a plurality of rows of discrete, steel cords 27 which extend in the longitudinal direction of the cable. To make the cable 26, single rows of cords 27 are first individually precoated and wholly encapsulated in a flexible plastics medium 28, such as polyurethane, to be directly bonded thereto and form therewith strips 29. In each row of steel cords 27 there is a multiplicity of high tensile stranded steel cords which are disposed side by side and spaced from one another. The steel cords 27 may be introduced into the plastics medium 28 by an extrusion process, preferably with preheating of the cords just prior to their entry into the extrusion head to ensure intimate bonding of the steel cords and the plastics medium. Purely by way of example, in one row there may be 19 encapsulated steel cords each consisting of a king wire, 6 wires helically wound on the king wire with a right hand lay at 2.0″ pitch and 12 further wires wound on with a left hand lay at 4.0″ pitch, all the wires being 0.022″ diameter 110/120 ton tensile steel and the finished cord being roll-formed to a diameter of 0.1″. Other numbers of cords, and types of cord composition may, of course, be employed.

However, it is not necessary that the cords should be of steel; other high tensile fibres

may be employed, such as nylon, Terylene (Registered Trade Mark), flexible glass or carbon fibres, encapsulated in any appropriate plastics or elastomeric medium.

A number of the strips 29 are then superimposed one upon another to build up a laminate in which the strips constitute layers each of which extends substantially the width of the cable. Finally, the laminate is wholly encased in an outer surrounding layer or matrix of plastics medium 30 to which the laminate is directly bonded, as shown in Figure 1. In this example, the completed cable 26 contains three individual precoated rows of cords 27 but there could be more or less than three.

In Figure 3 a modification is shown in which the steel cords 31 of an individual row, encased in plastics medium 32, are staggered alternately up and down.

Figure 4 shows a further modification in which flat steel strips or filaments 33 are employed instead of round cords. In the particular arrangement illustrated, single strips or filaments 33 situated on the central lateral plane of the individual layer 34 alternate across the width of the layer with pairs of filaments disposed one on either side of said plane. But other arrangements are possible, including dispositions in which the filaments are in overlapping relationship across the width of the layer. The individual filaments 33 may, for example, be 10mms wide and 1mm thick with rounded edges 35.

Lifting cables as described provide good flexibility in both longitudinal and axial planes while resisting to a high degree the twisting of the loads carried that is a characteristic of conventional cables of generally round configuration. Moreover, the handling of the cable is improved, as is also the design of shrouded sleeves and winding drums therefore. Due to the wide area of contact between the cable and any driving drum or pulley around which it passes slip is minimised. This reduces wear on the encapsulating medium of the cable; the encapsulated load-bearing elements do not wear as they are in contact neither with the members of the handling gear nor with one another.

In view of the high degree of frictional engagement between the cable and each drum or pulley around which it passes, it is particularly suited to progressive off-loading of tension by passage round a succession of power-driven pulleys. Figure 5 shows a winch comprising a main winding or cable-storage drum 18 and a succession of pulleys 19, 20, 21 around which the cable 22 is looped sinuously in its path to the drum, there being a substantial arc of contact maintained at each pulley. The drum and each of these three pulley is power-driven from the same drive motor through a gear train, with the result that each sustains a portion of the load and there is a progressive off-loading of cable tension as the drum 18 is approached. In this way, an initial cable tension in excess of 8000 lbs can be reduced to a figure in the order of 1000 lbs or less at the drum.

In addition to the driven pulleys, the arrangement includes an idler pulley 23, and a tension control pulley 24 which engages the cable stretch between the driven pulleys 20 and 21 and sends a tension-indicating signal to a speed control device that varies the speed of only the storage drum 18 to allow for the changing effective diameter of this drum as cable is wound on and thereby maintain the tensions in the cable substantially constant.

Attention is drawn to our co-pending patent application No. 436/73 (Serial No. 1,362,514) which has been divided out from the present application and which discloses the same subject matter but claims the winch *per se*.

WHAT WE CLAIM IS:—

1. A ribbon-like cable constituted solely of a laminate wholly encased in and directly bonded to a plastics matrix,

the laminate being constituted solely of a plurality of layers superimposed one upon another with each layer extending substantially the width of the cable,

each of the individual layers being constituted solely of a plurality of discrete, flexible filaments of a reinforcement material which extend in the longitudinal direction of the cable and which are wholly encapsulated within and directly bonded to an encapsulating material which maintains the filaments of the layer in positions separated both from one another and from the filaments of the or each adjacent layer of the laminate.

2. A lifting cable substantially as herein described with reference to Figure 1, or Figures 2 and 3, or Figure 4 of the accompanying drawings.

3. The combination of a cable according to claim 1 or claim 2 with a winch for said cable, said winch comprising a cable storage drum and a plurality of pulleys around which said cable is led in a sinuous path toward the drum so as to give a substantial arc of contact at each pulley, the drum and the pulleys all being power-driven in an arrangement such that the tension in said cable reduces from pulley to pulley as the drum is approached.

4. The combination according to claim 3, wherein said winch includes means for sens-

ing the cable tension between two pulleys and varying the speed of the drum only, thereby to maintain substantially constant tensions as the effective winding diameter of the drum changes.

5. The combination according to claim 4, wherein said winch is substantially as herein described with reference to Figure 5 of the accompanying drawings.

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2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

FIG.2.

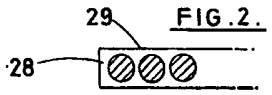

FIG. 1.

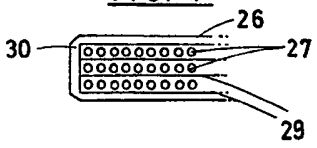

FIG.3.

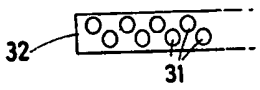

FIG.4.

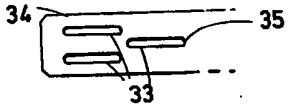

FIG.5.